Missouri Resources

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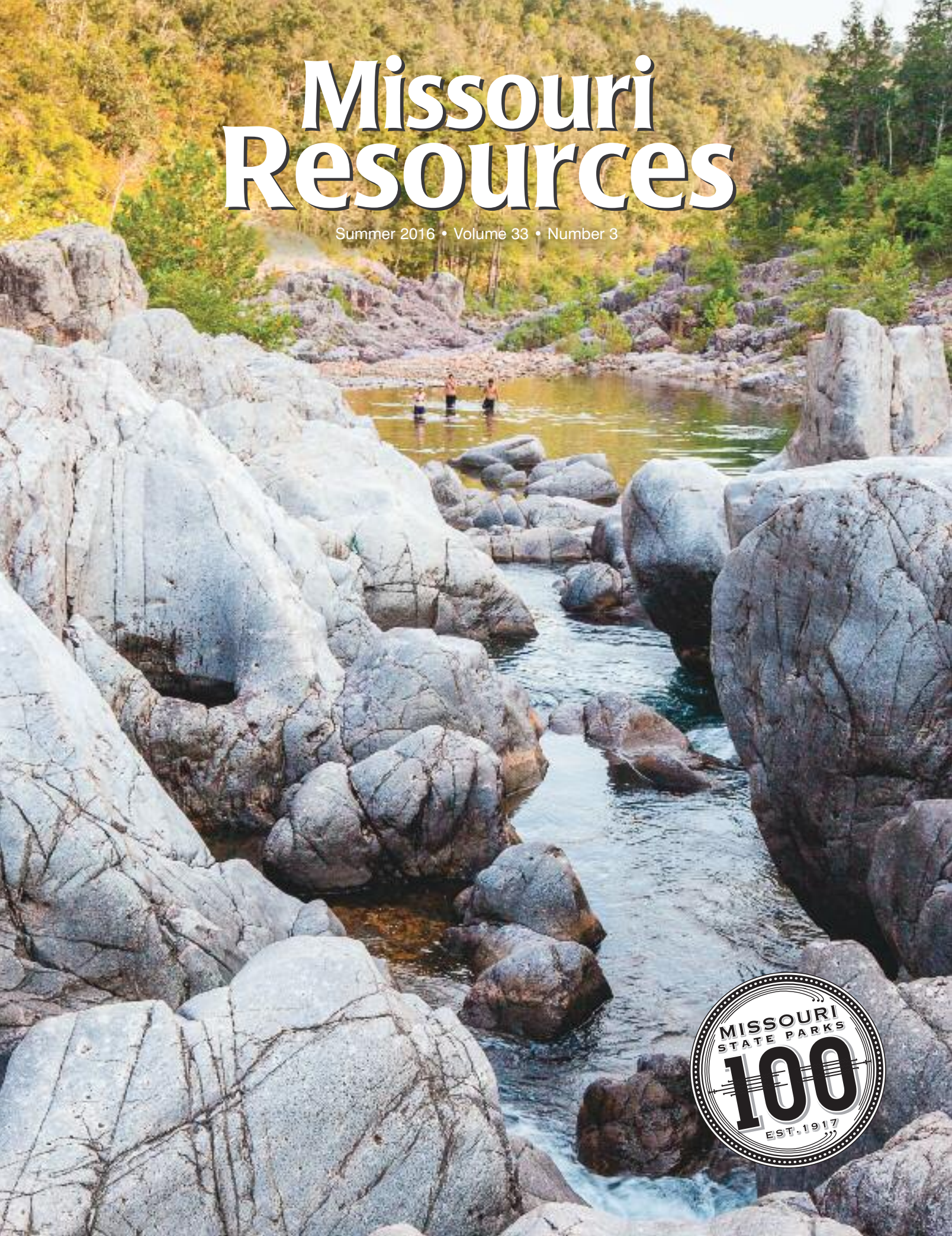

director's comment

In 1982, the late Rep. LeRoy Braungardt, 49th district from Moscow Mills, approached a very determined Merle Doughty about establishing a sales tax to support soil conservation. Missouri, at the time, held the second highest rate of erosion in the nation. Doughty, who served on the Livingston County Soil and Water Conservation District and was president of the Missouri Assoc. of Soil and Water Conservation Districts, was adamant about keeping our valuable soil on the productive agriculture lands.

Doughty had testified many times in Washington D.C. and Missouri in his quest to gain funding and support to address soil erosion. His tenacity toward the cause sparked the interest of the state representative and they began laying the ground work to reach a solution.

In 1983, Rep. Braungardt introduced a joint resolution to establish a sales tax that would support not only soil erosion but also Missouri's state parks and historic sites that were facing tremendous federal budget cuts. Rep. Braungardt's resolution passed just moments before the legislative session ended.

Doughty and Braungardt continued to garner support for the sales tax by creating a citizens committee that would provide information about the sales tax to Missouri voters. And, in 1984, the voters approved the now called, Parks, Soils and Water Sales Tax. The tax is placed on the ballot every 10 years to reaffirm voter support for the park system and soil and water conservation efforts. The Parks, Soils and Water Sales Tax comes up for a vote again this year.

Cultural anthropologist and academic Margaret Mead once said, "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."

This is certainly true when it comes to the efforts behind the Parks, Soils and Water Sales Tax. It is a story of a handful of people, working together to gain the support of thousands of people throughout our great state to obtain funding to reduce soil erosion and improve water quality, as well as support Missouri state parks. Learn more about the tax by reading Support for Success, Missouri's Parks, Soils and Water Sales Tax *in this issue of* Missouri Resources.

Remember, it takes each of us to make a difference for all of us. With your continued support, we can help make Missouri an even better place to live, work and enjoy the great outdoors.

Sara Parker Pauley

Sara Parker Pauley
Missouri Department of Natural Resources

Missouri Resources

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Mission Statement
The mission of the Missouri Department of Natural Resources is to protect our air, land and water; to preserve our unique natural and historic places; and to provide recreational and learning opportunities for everyone.

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Above: The Missouri State Capitol was built almost entirely from Missouri-quarried stone. The Governor's Mansion used red granite from a quarry just outside Elephant Rocks State Park for its majestic front porch columns (see story page 12).
Front Cover: Swimmers wade as the last evening glow of summer sunlight fades at Johnson's Shut-Ins State Park.
Back Cover: Stockton State Park is one of 88 state parks and historic sites to "stamp off" in the Missouri State Parks Centennial Passport. *MoDNR photos by Ben Nickelson.*

HIGHWAY TO HAZARDOUS

Truck accidents require quick environmental response

by Lisa Nahach

On a snowy afternoon in February 2015, a bus rear-ended a tractor-trailer on Interstate 44 in Rolla. The collision led to a pileup involving an additional 11 tractor-trailers and 18 other vehicles, according to the Missouri State Highway Patrol. Miraculously, no one was killed.

However, one of the tractor-trailers held 45,000 pounds of a hazardous material used to coat wires. Nine plastic totes ruptured, spraying the material over a large area.

According to state law, all releases of hazardous substances fall within the realm of the Missouri Department of Natural Resources. The department learned of the accident via its 24-hour spill line, and the Environmental Emergency Response Section dispatched state on-scene coordinator Don Kinkhorst, who worked at the scene 26 hours the first two days to ensure the site was properly cleaned up.

"I knew the personnel working at the scene, and my management were counting on me to plan and execute the cleanup," noted Kinkhorst. "I didn't want to let them down by being absent at any point during the process."

(Left) In January 2015, a tractor trailer carrying 45,000 pounds of hazardous materials was extensively damaged during a multi-vehicle accident near Rolla. The crash resulted in the release of hazardous materials and required the expertise of a Department of Natural Resources state on-scene coordinator to oversee the cleanup.
(Below) The cargo carried by the 11 tractor trailers involved in the pileup spanned from hazardous materials to candy. MoDNR photos (left and below) by Don Kinkhorst

Although the hazardous material was rust colored, Kinkhorst said it was difficult to see because of the rapidly falling snow. Motorists and first responders were unknowingly exposed while helping extricate drivers and passengers from vehicles.

Seventeen people were affected according to Ron Smith, chief of the Rolla Fire & Rescue Department. Symptoms included coughing, difficulty breathing and minor burns. The department set up decontamination stations near the accident site and at the local hospital, which treated victims for injuries. At the decontamination stations, victims removed contaminated clothing and showered. The American Red Cross provided replacement clothing for all affected.

Kinkhorst delivered a multitude of services. He monitored ambient air, tracked the spill, determined how to clean it up and provided protective foot gear to law officers.

"This situation was near [to] the best-case scenario as far as exposure goes," said Kinkhorst, who was named the Department of Natural Resources' January 2016 employee of the month for his work at the scene. "It was very cold at the time of the incident. It was outdoors, and the hazardous

HAZARDOUS SPILLS

NONHAZARDOUS SUBSTANCES

MoDNR photo by Andrew Richmond

A spill does not have to involve a hazardous substance for the Missouri Department of Natural Resources to oversee cleanup.

Case in point: a spill of almost 6,600 gallons of semi-refined soybean oil, originally destined to become biodiesel. The spill occurred November 2015, near Mexico, Mo., after an accident on Route J in Audrain County.

The spilled soybean oil looked like the benign aftermath of a heavy rain, but state on-scene coordinators Ken Hannon and Brittany King knew otherwise.

At least three factors necessitated prompt cleanup. First, the accident triggered the release of a substantial amount of soybean oil, most of which lay beneath matted grass. Second, the spill impacted private property. If not addressed, the spill could have affected the property's use and value. Finally, the spill occurred in a drainage ditch that flows to a local creek. If not removed, the soybean oil could have migrated to the creek. As the soybean oil broke down, the oxygen level of the water likely would have dropped.

"This could've, in effect, choked out plants and affected wildlife," said Ken Hannon. "It was an environmental hazard."

Several days after the accident, Brittany King returned to Audrain County to assess restoration efforts. The towing and recovery company had collected 385 gallons of liquid, which the company disposed of in an incinerator. The firm also had excavated the land affected by the spill; taken the excavated dirt, grass, and brush to a landfill; brought in clean fill; and seeded the area.

The prompt response thwarted a potential environmental hazard.

material was able to volatilize freely into the atmosphere."

In 1983, the Missouri Hazardous Waste Management Law established the department's 24-hour spill line. The statute requires anyone who has control over a hazardous substance to contact the department upon discovery of a release. Furthermore, if anyone having control over a hazardous substance does not clean up a release, the state can hold the responsible party liable for cleanup costs. However, the department usually receives cooperation from trucking companies and cleanup crews.

State on-scene coordinators respond to reports from any one of six locations: Jefferson City, St. Louis, Poplar Bluff, Kansas City, Macon and Springfield.

Calls regarding truck spills come from drivers, fire departments, towing services, trucking companies, and law enforcement, among other sources. Callers may even report an incident anonymously by calling 573-634-CHEM (2436).

Department duty officers document information about reported incidents into the Missouri Environmental Emergency Response Tracking System. Anyone may access reports online at dnr.mo.gov/env/esp/meerts.

During 2015, the department received 195 reports regarding vehicular accidents that resulted in releases of potentially hazardous substances. Of these, 53 required a response from a state on-scene coordinator.

However, calls to the spill line pertain to any event that may impact the environment. Each year, the spill line receives more than 1,500 incident reports, 20 percent of which warrant an in-person response. Cases range from fires to mercury spills from broken thermometers.

State on-scene coordinators provide knowledge, as well as supplies and equipment. Supplies include personal protective gear and oil-absorbent pads. Equipment includes thermal-imaging cameras, as well as instruments to determine water qual-

ity, detect radiation and identify unknown chemicals. In addition, state on-scene coordinators help responsible parties to cooperate quickly with first responders.

"Sometimes, they give us the extra push we need," said Smith. "They have the authority to get things moving a little bit quicker. They reduce some of the go-between," added the Rolla fire chief.

Cleanups vary from release to release. Consider the February 2015 pileup in Rolla, which led to the spill of 45,000 pounds of hazardous material. State on-scene coordinator Kinkhorst could see that in order for the cleanup to proceed as quickly as possible, the cleanup contractor needed to immediately manage the hazardous material and decrease the likelihood of migration.

Kinkhorst directed the contractor to add an absorbent to the spilled hazardous material. Typically, state on-scene coordinators look for something readily available. In this case, Kinkhorst was able to access cinders stockpiled for winter.

"During the emergency phase, state on-scene coordinators have the latitude to make decisions, such as this, in order to protect life, property, and the environment," Kinkhorst said.

Ultimately, the contractor collected two sets of waste after the accident: one nonhazardous and the other hazardous. The nonhazardous waste consisted of 841 tons of contaminated soil, vehicle parts and miscellaneous debris. The cleanup contractor deposited this nonhazardous waste in a permitted landfill in Missouri.

In addition, the contractor used a pump to collect 3,740 gallons of hazardous material and water. The contractor shipped this waste to Texas, where it was disposed of by deep-well injection, an EPA-approved underground storage method. Missouri has no such permitted sites.

The cleanup lasted a month, and afterward, motorists on Interstate 44 would not have known that a dangerous hazardous substance spill had taken place.

Lisa Nahach is a public information specialist serving the department's Environmental Services Program.

(Below) Department on-scene coordinators respond to hazardous material releases with specially equipped trucks that provide them with the tools needed to assist with and oversee accident cleanups. (Bottom) Contaminated soil is removed and replaced by the party responsible for the release in order to return the site to the same condition it was prior to the accident.

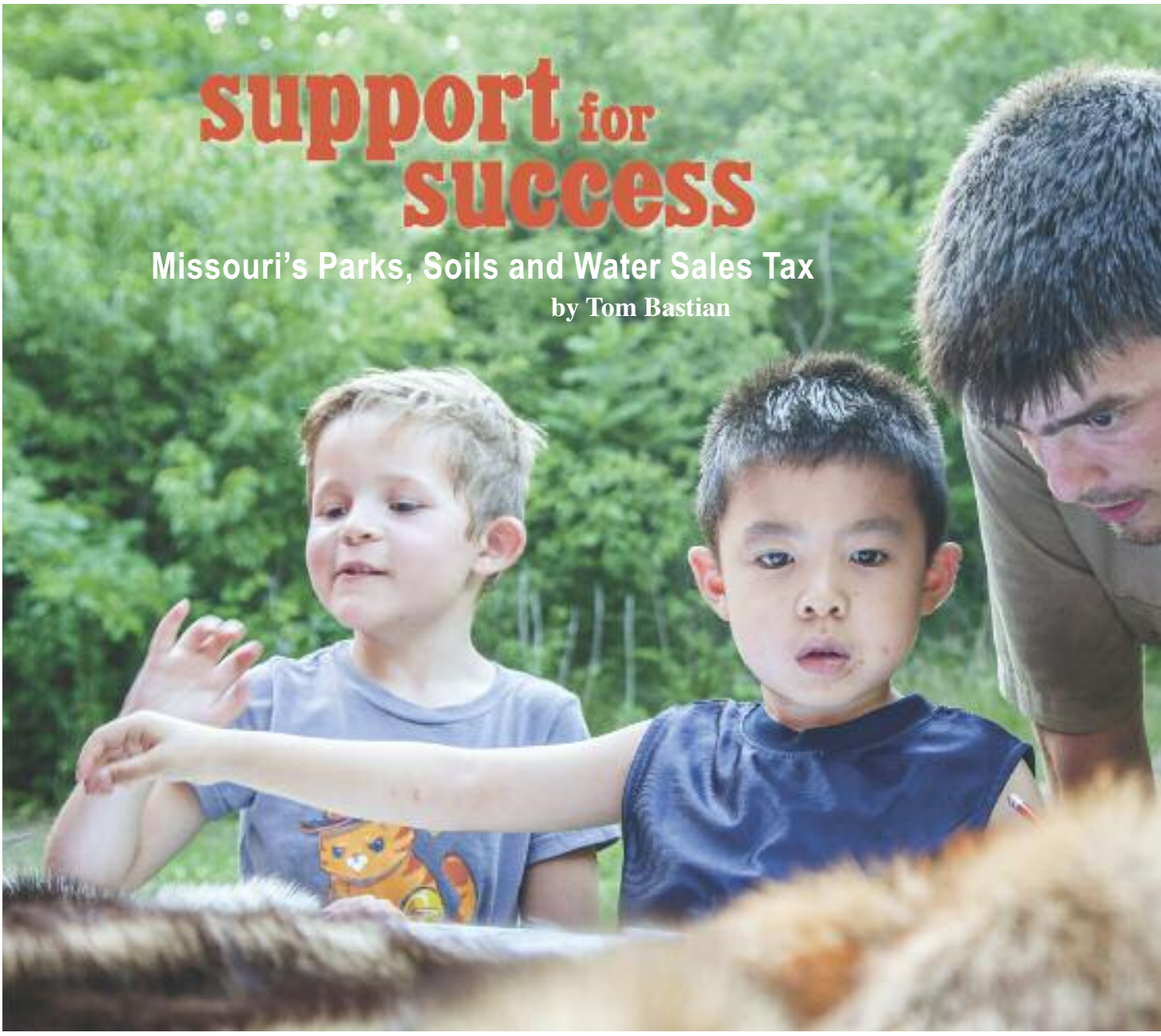
MoDNR photo by Andrew Richmond

MoDNR photo by Don Kinkhorst

support for success

Missouri's Parks, Soils and Water Sales Tax

by Tom Bastian



MoDNR photo by Ben Nickelson

An interpreter helps Learn to Camp participants identify mammal furs. The staff at Missouri State Parks are committed to their educational interactions with park guests.

Leaves rustling in a gentle breeze, water cascading down a rocky hill; a near-forgotten flower soaking in the scattered sun breaking through the tree canopy; the subtle sound of a carefree ornate box turtle rummaging through the forest floor in search of a meal – all are common sights and sounds on the winding trails found in your Missouri state parks and historic sites.

The parks, located throughout the diverse regions of our state, have served as a temporary escape and an opportunity for reconnection with the beauty of nature for many Missourians and visitors from other states. Historically, Missourians have sought to preserve portions of the land so generation after generation will have the opportunity to enjoy the rich beauty of the state we call home.

In order to preserve our parks, many citizen-support organizations and individuals worked together with the Missouri General Assembly to create a one-tenth-of-one-percent sales tax through a constitutional amendment. Missouri voters approved what is now called the Parks, Soils and Water Sales Tax in 1984. Voters continued their support by reapproving the tax in 1988, 1996 and 2006. Due to continuous citizen

MoDNR photo by Ben Nickelson

MoDNR photo by Ben Nickelson

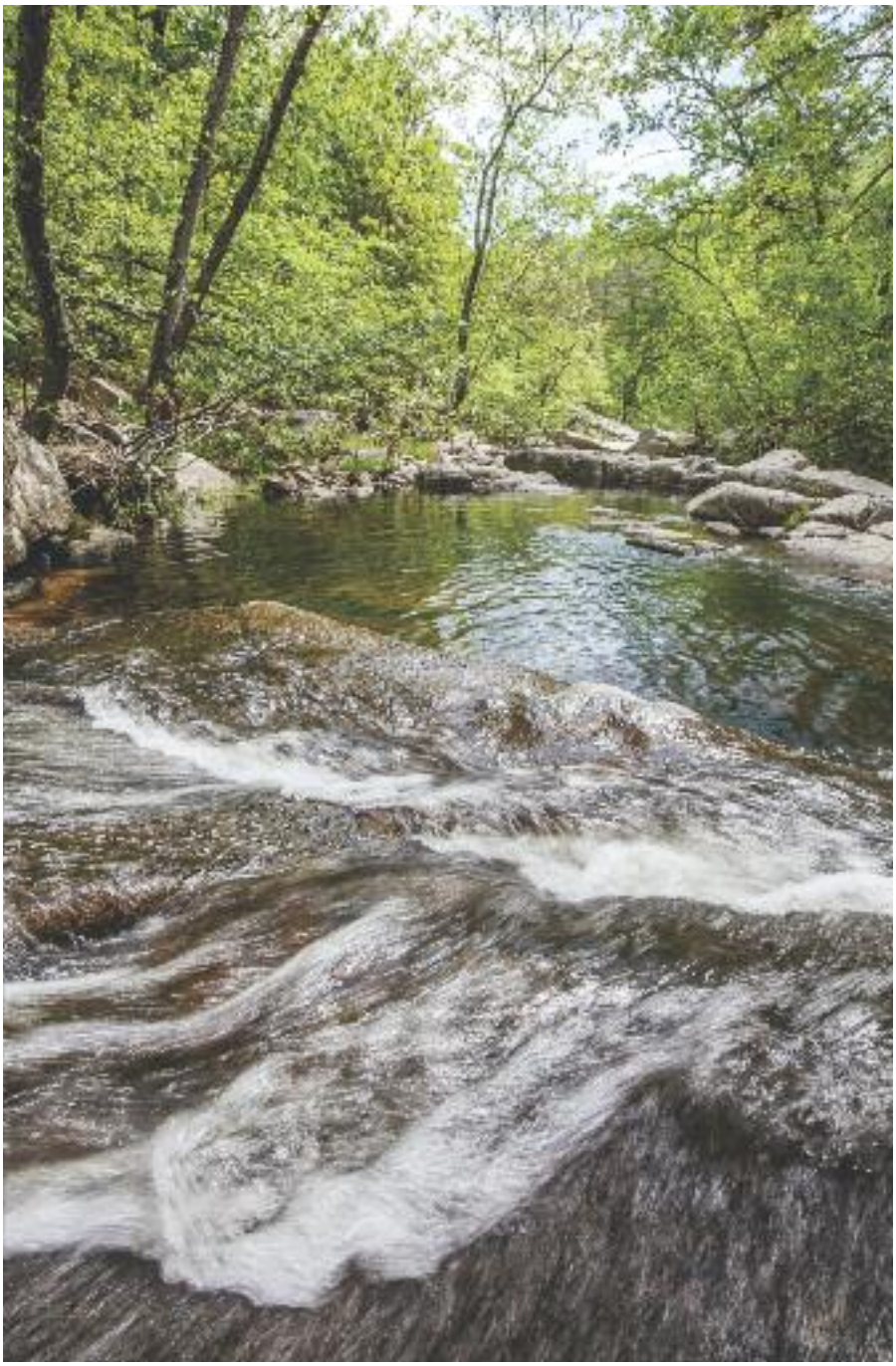
support, the 2006 renewal received its highest public approval with a two-thirds majority.

The Missouri Department of Natural Resources divides the revenue generated from the sales tax equally between Missouri's state park system and the Soil and Water Conservation Program.

"The sales tax provides critical funding for core functions that the department has responsibility for," said Sara Parker Pauley, director of the Department of Natural Resources. "That includes protecting our soil resources, improving water quality and managing an award-winning state park system for our guests."

The consistent funding has allowed Missouri State Parks to maintain and upgrade the state park system in a variety of ways to better serve the needs of visitors while still protecting valuable natural, cultural and historic resources. Much of the basic maintenance includes repairing and renovating buildings, restrooms, shelter houses and cabins while also stabilizing and protecting historic structures throughout the system. In addition, the 88 locations within the state parks system include 49 regulated public water systems, 96 wastewater systems, 260 miles of paved roadway, and more than 1,000 miles of trail. The parks

(Top) Campers set up a tent at Lewis and Clark State Park in Buchanan County. (Above) The Alta Shelter at Dr. Edmond A. Babler Memorial State Park, built by the Civilian Conservation Corps in the 1930s and damaged in a fire, was recently restored using Parks, Soils and Water Sales Tax revenue.



MoDNR photo by Ben Nickelson

and historic sites also have more than 130 shelters and 3,600 campsites available for public use.

"The Parks, Soils and Water Sales Tax provides a consistent funding mechanism that allows us to operate and improve our system of state parks and historic sites from year to year," said Bill Bryan, director of Missouri State Parks. "We're proud to say that Missouri state parks and historic sites continually earn a high visitor approval rating, and are consistently ranked as one of the top four state park systems in the nation."

Some of the recent projects funded by sales tax revenue include cabin renovations at Montauk State Park; roof repair at Mark Twain Birthplace State Historic Site; restoration of the historic Civilian Conservation Corps (CCC) Alta Shelter at Dr. Edmund A. Babler Memorial State Park; and many more.

Another benefit of the tax is that Missouri state parks and historic sites do not charge an entrance or day-use fee to the public. This ensures that everyone has the opportunity to enjoy the natural splendor of our state. On average, more than 18 million people visit the state park system each year.

Missouri state parks and historic sites also contribute to a healthy economy. An economic impact study released in 2012 estimated that annual expenditures of state park visitors total approximately $778 million. After this money enters the local economy, the overall impact of these expenditures is estimated at $1.02 billion in sales, $307 million in payroll and related income, and $123 million in federal, state and local

MoDNR file photo

taxes. Park visitors' expenditures support 14,535 jobs throughout the state.

"As guests travel to and from state parks to enjoy outdoor recreation and explore history, communities around the state benefit from busy hotels, motels, restaurants and retail stores," said Bryan.

Missouri State Parks is committed to providing a high level of visitor services. In order to do so, there must be enough staff to provide clean and safe facilities, enough interpreters to present the significance of each of the parks and historic sites, enough law enforcement personnel to ensure visitor safety, and enough general staff to provide adequate service to the public.

Soil and Water Conservation

While the benefits of the park system are more visible to the general public, Missouri's Soil and Water Conservation Program has a large impact on agriculture, landowners, consumers and Missouri's growing economy. Abundant water re-

MoDNR photo by Ben Nickelson

(Opposite page) The clear waters of Pickle Creek run though Hawn State Park. (Above) Much of the soil and water portion of the sales tax has been used to assist agricultural landowners through programs developed by MoDNR's Soil and Water Conservation Program. (Left) Run-off from soil erosion also erodes water quality. (Bottom pages 8-9) A farmer plants his spring crops in fertile Missouri River bottomland. MoDNR file photo

"Back in 1984, Missouri became the first state in the nation to pass a Parks, Soils and Water sales tax, and since then, this initiative has been renewed overwhelmingly three times.

Missourians deeply value the outdoors and our natural resources, and their continued commitment to this effort has made our state a national leader in soil conservation.

By partnering with local communities and landowners, Missouri has gone from being the state with the second-highest soil erosion to being among the best states in the nation for reducing erosion. To date, more than 177 million tons of soil have been prevented from eroding into our streams, rivers and lakes.

Additionally, the Parks, Soils and Water sales tax continues to be a vital funding source for our nationally recognized system of 88 state parks and historic sites.

Over the years, while other states have closed parks and charged entrance fees, Missouri State Parks continue to be open and free to all, reaching record attendance in 2015 with 19.2 million visitors.

The accomplishments made possible through the Parks, Soils and Water sales tax – reduced erosion, cleaner water, and state parks that are among the best in the nation – have been a remarkable success story for Missouri. Missourians have given this program their support for several decades, and I am confident that support will continue for many years to come."

JEREMIAH W. (JAY) NIXON
Governor

Paul Davis, Poplar Bluff *Daily American Republic*

sources and clean drinking water benefit all Missourians, regardless of what they do, where they live or how they spend their recreational time.

After the Dust Bowl of the 1930s, Americans realized how devastating soil erosion could be as an estimated 300 million tons of soil had been lost. Missouri had the highest rate of erosion in the nation, which led to the creation of the Missouri Soil and Water Districts Commission in 1943.

Soil erosion adversely affects local and national food supplies and economies. Erosion, often caused by stormwater runoff, carries soil and fertilizers away from fields and into the waterways, which impacts downstream water quality. The eroded soil can destroy valuable aquatic habitat such as fish spawning areas and can cause contaminates to enter drinking water supply systems. This creates higher treatment costs for local water systems and raises utility bills for Missourians and others downstream.

In 1982, Missouri continued to lose soil at an annual rate of 10.8 tons per acre through erosion on cultivated cropland. The department's Soil and Water Conservation Program and the 114 Soil and Water Conservation Districts help landowners and farmers control and minimize erosion across our diverse state. However, a consistent funding source did not exist.

"All life depends on healthy, productive soil and clean, abundant water," Pauley said. "We depend on high-quality water for drinking and healthy land for agricultural and industrial purposes that drive our state's economy while putting food on the table for our families."

Since the passage of the Parks, Soils and Water Sales Tax, the impact of the soil and water conservation districts has been substantial. The districts have provided more than $660 million to Missouri agricultural and private landowners to implement more than 220,000 soil and water conservation practices over the past 32 years.

"The Soil and Water Conservation Program, through local, state and federal partnerships, promotes farming

MoDNR file photo

(Left) In Missouri, 14.8 million acres of land are considered cropland, half of which are highly erodible. (Below) Led by a Missouri State Parks interpreter, a school group enjoys a hike at Ha Ha Tonka State Park in Camdenton.

techniques and conservation practices that have kept more than 177 million tons of soil on our fields and out of our waters while preserving the productivity of Missouri's farms," said Colleen Meredith, director of the Missouri Soil and Water Conservation Program.

Of Missouri's 44.6 million acres of land, 14.8 million are considered cropland, with almost half of that classified as highly erodible.

The consistent funding stream allows the soil and water conservation districts to offer cost-share programs to farmers and landowners to implement effective conservation practices. The cost-share programs provide partial reimbursement of the cost – up to 75 percent – for the installation of conservation practices that prevent or control excessive erosion and improve water quality.

Some of these practices include buffers, grazing systems, cover crops and sediment basins. The funding also provides for research and water quality monitoring. These efforts identify new methods for soil and water conservation practices that produce the best results for preventing erosion and protecting Missouri's water quality.

"It says a lot about Missouri's citizenry when they know how important our natural resources and our state park system are that they would vote and vote again to approve the Parks, Soils and Water Sales Tax designed to improve those resources throughout the state," said Pauley.

For more information about the Parks, Soils and Water Sales Tax, visit dnr.mo.gov/parks-soil-water.htm.

Tom Bastian is communications director for the Missouri Department of Natural Resources.

MoDNR photo by Ben Nickelson

Building Stones of Missouri

by Missouri Geological Survey staff
photographs by Ben Nickelson

Human history has clearly demonstrated that natural stone is a durable, long-lasting and aesthetically pleasing building material. It is rivaled by manmade bricks and concrete, which could be categorized as artificial stone. Much of the natural stone used in buildings in Missouri was quarried in the state and the stone has proven to be a strong and often regal building material.

The Egyptian pyramids and Stonehenge were built thousands of years ago

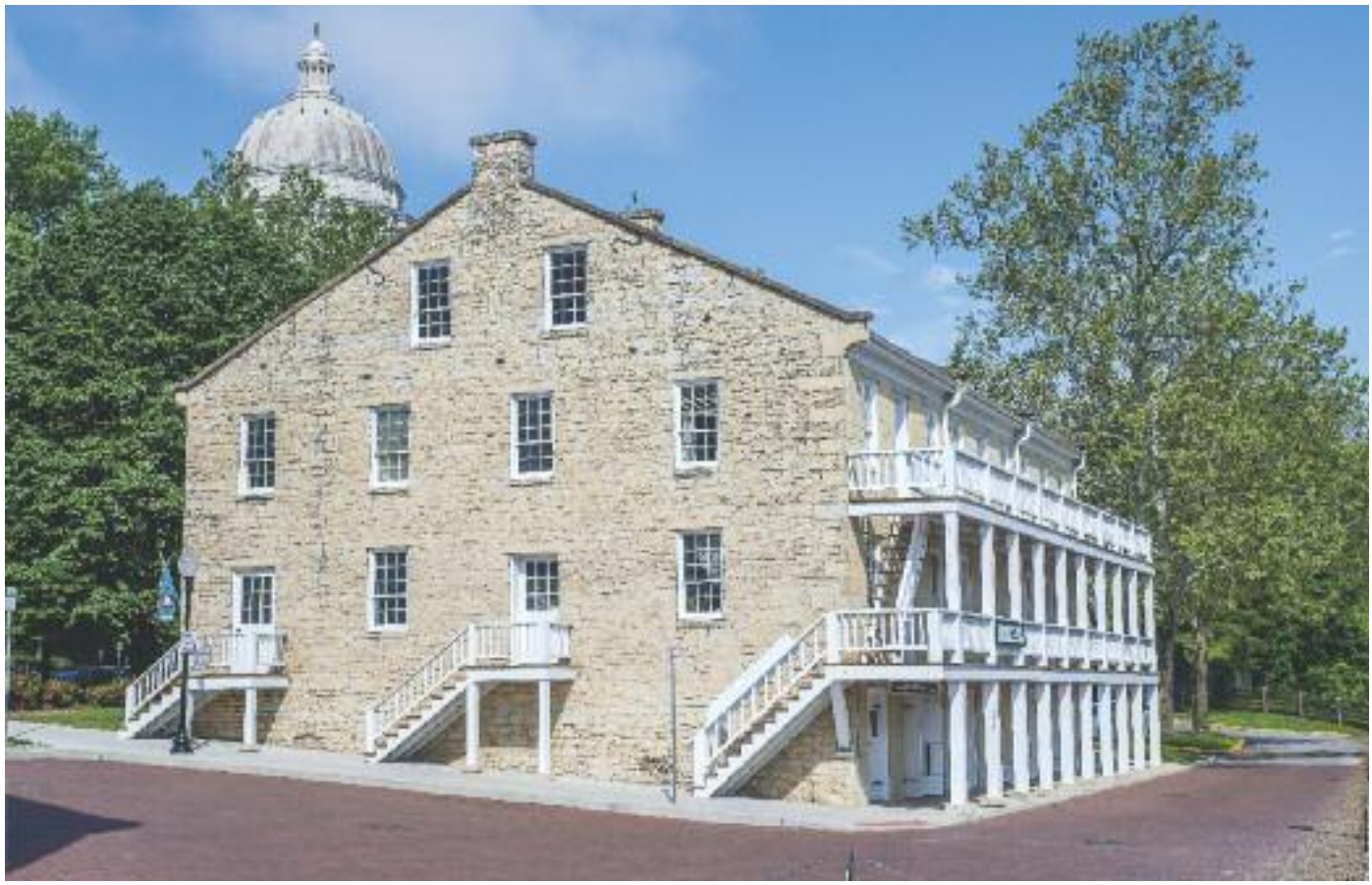
with blocks of natural stone, and they are still standing. The magnificently regal ancient Greek and Roman buildings that were made with natural stone are still there.

Structures made with natural stone last a long time because they are inherently resistant to most of the agents and forces that act to destroy them. Natural stone has commonly been the building material of choice for structures that are meant to symbolize, honor, worship, enshrine, commemorate, monumentalize, showcase and memorialize things that are considered important to society. Statues of political and military leaders, religious figures, and symbols of liberty, freedom and justice are often rendered from stone. Historically, natural stone also was used to build secure jails and prisons to hold criminals.

Atop a limestone bluff in Jefferson City, the Missouri State Capitol was built in the Roman Renaissance style with marble-like, fossil-bearing limestone from Carthage in Jasper County and Phenix in Greene County. It was during the construction of the interior that polished Missouri limestone gained the distinction of being called "marble." The eight columns on the ground floor of the Capitol inside the Missouri State Museum were made with red granite from the St. Francois Mountains region in southeastern Missouri, as were the four columns on the exterior of the nearby Governor's Mansion on Madison Street.

"Benjamin Gratz Brown, Missouri's 20th governor [1871-1873], made a unique contribution to the Governor's Mansion by donating the granite columns for the portico, thus starting the tradition of each first fami-

(Opposite page) The Cole County Courthouse, built in 1908, employed two kinds of Missouri stone – limestone and sandstone.
(Above) Under the watchful eye of the *Great Rivers – Mississippi* statue, construction workers restore stone steps on the south entrance of the Missouri State Capitol, built in 1917.
(Below) The impressive Harry and Susan Seigle Hall at Washington University in St. Louis was dedicated in 2008. The imposing facility was built using Missouri granite.



(Above) Jefferson City's oldest structure, the Lohman Building, was built in 1839. Its locally quarried limestone has stood the test of time. (Right) The entrance to City Hall in University City is faithfully guarded by a pair of limestone lion sculptures.

ly leaving a gift to the Mansion," said Natalie Tackett of the Cole County Historical Society. "The granite came from Brown's quarry in Iron County."

On the other side of Madison Street is the Cole County Historical Society Building, a Victorian-Reconstruction era version of the urban residential row house.

"It was built in 1871 and restored in 1948 by the Cole County Historical Society. Renovation at that time included addition of bracketed cornice detailing and false quoins. The building was built by Gov. Brown on property owned by his wife Mary Gunn's family," Tackett said.

The limestone cornices are decorative and protect the structure's walls from rain runoff. The quoins are limestone blocks at the corner of the outer walls that, although ornamental in appearance, often provide strength for a structure.

Southeast from the Capitol, the Romanesque Revival style Cole County Courthouse has stood with cathedral-like grandeur since its

(Above) The University United Methodist Church in University City was built with limestone. Constructed in 1925, the church is aging with beauty, strength and grace.
(Below left and center) The First United Methodist Church in Jefferson City was built in 1900 using locally quarried limestone.
(Below) Bethel Lutheran Church in St. Louis was built in 1926 with limestone.

(Above) The entrance of the Missouri Supreme Court Building in Jefferson City, built in 1877, is preceded by granite steps and surrounded by ornamental stone blocks and sculpture. (Right) Small limestone sculptures tucked into various corners of the University United Methodist Church suffer the environmental ravages of time (see church page 15).

completion in 1908. It was built using two types of Missouri stone. The first and second stories were built with limestone that probably was quarried locally. The third story was built with sandstone that was secured just north of Warrensburg.

The Lohman Building, situated next to the Missouri River, was built with local limestone in 1839. Now part of Missouri State Parks' Jefferson Landing State Historic Site, it is the oldest building in Jefferson City. It served as a grocery store, warehouse, tavern, telegraph office and hotel for the growing capital city. Jefferson Landing State Historic Site is significant as a rare Missouri River landing.

Today, the Lohman Building depicts an 1850s general store and warehouse, and features a film on the history of the site and of Jefferson City. It also serves as a support facility for the Missouri State Museum, located on the ground floor of the Capitol.

"Completed in 1840, the old Missouri State Penitentiary and its containment walls were built with limestone that was quarried locally," Tackett said. "Some of the blocks came from the Governor's Mansion that was torn down when the current one was built." Tackett added.

Learn more online about the Capitol and history of the county at the Cole County Historical Society's website at colecohistsoc.org.

In Missouri, there are numerous public and commercial buildings and private residences that were built all or in part with natural stone from the state. While traveling, it can be fun and educational to view and marvel at the structures that were made with natural stone. Most of them have been around a long time and should be around for many decades to come. Many are on the National Register of Historic Places.

Standing the Test of Time

Only certain kinds of natural stone that possess superior quality can be used for building purposes. Limestone, marble, sandstone, quartzite and granite are the primary building stones. Geologically speaking, marble is metamorphosed limestone, and quartzite is metamorphosed sandstone. Marble and quartzite do not occur in Missouri, but there is plenty of sandstone and marble-like limestone.

Ideally, the chosen stone should be devoid of natural weaknesses along which major cracks and breaks could occur. It should not contain streaks or pockets of shale or clay, which swell when wet, shrink when dry and eventually crumble out. The stone should be resistant to freeze-thaw spalling and should not contain iron pyrites. These oxidize in the presence of water and form rust stains.

Important structures in our nation's capital in Washington, D.C., were built

(Left) The ornate double columns on the west side of the Cole County Courthouse are made of limestone.
(Below) Standing strong, the stalwart Jefferson City Post Office, built with Missouri limestone in 1934, appears to be good for another century – or two.

with natural stone that was quarried at different places across the United States, including Missouri. Marble-like limestone from Carthage in Jasper County and Phenix in Greene County in southwestern Missouri was used in the interiors of the U.S. Commerce Department Building and the National Gallery of Art West Building. Marble-like "Golden Vein" limestone from Ozora in Ste. Genevieve County in southeastern Missouri was used in the portion of the National Archives Building that houses the Declaration of Independence, the Constitution and the Bill of Rights.

Granite and quartzite are the most durable and chemically resistant. Some kinds of granite are better than others in this regard. The downside of limestone is that it is ever so slightly soluble in pure water and much more so in water that is acidic. Acid rain that results from natural and manmade atmospheric pollutants does etch and corrode limestone over time. The previously mentioned aqueous oxidation of iron pyrites produces sulfuric acid that reacts with and dissolves the limestone in the immediate vicinity of the decomposing iron pyrites. This forms a white, powdery, water-soluble mineral called gypsum.

Environmental concerns notwithstanding, natural stone is the natural choice for strength, visual impact and longevity. Missouri stone exemplifies these characteristics.

Read about Missouri's industrial minerals at dnr.mo.gov/geology/geosrv/imac/indminerals.htm.

The Missouri Geological Survey is a division of the Missouri Department of Natural Resources.

Visiting Missouri's

story and photographs by Tom Uhlenbrock

Down by the old mill stream – you can still enjoy a peaceful picnic at two vintage grist mills that now are state historic sites.

Bollinger Mill State Historic Site is in southeast Missouri, 13 miles west of Jackson at Exit 99 off Interstate 55. The site has a four-story stone-and-brick mill building, plus the 140-foot-long Burfordville Covered Bridge. Completed in 1868, the bridge is the oldest of the four covered bridges maintained by Missouri State Parks.

Dillard Mill State Historic Site features a barn-red mill building on Huzzah Creek off Highway 49 south of Steelville in central Missouri.

With an abundance of flowing streams, particularly in the south part of the state, settlers took advantage of the free power source to build mills that ground grain and cut wood. A 1902 map shows more than 900 grist mills stretching to every corner of the state.

Bollinger Mill State Historic Site

In their day, the mills were the social center of the community, said Leslie McDaniel, site administrator at Bollinger Mill.

"Everybody came to the mill," she said. "They got their mail at the mill, got their supplies at the mill, caught up on gossip at the mill. If it was busy, they'd stick around, maybe fish, camp and visit with families and friends."

The original Bollinger Mill was started in 1800 by George Frederick Bollinger, but was burned during the Civil War. Solomon R. Burford bought the property and built the present mill on the old limestone foundation. The adjacent settlement became Burfordville, and construction began on the covered bridge.

Today, the stately mill has been restored and its interior of plank floors and mammoth wood beams displays milling machinery. The 43-acre site is along the Whitewater River and has a picnic area in a shaded grove, and a hiking path to the Bollinger family cemetery.

"We have picnic tables and grills – you can sit and take a peaceful look at the water flowing over the dam," McDaniel said. "You can take a tour of the mill building and walk over the oldest covered bridge in the state."

Dillard Mill State Historic Site

The quaint Dillard Mill reflects in the stillness of a fishing pond, while Huzzah Creek cascades noisily over a rock dam and natural waterfall.

The first Dillard Mill was built in the 1850s. It burned in 1895, but some of the original timbers were used in construction of the current mill, which was completed in 1908.

Yvonne Bobbitt, site administrator at Dillard Mill, said the mill is special because it retains much of the original equipment installed in 1907, in working condition. The

Historic Mills

mill, which has been added to the National Register of Historic Places, is operated during the 45-minute tours.

"You don't find many mills that actually work," Bobbitt said. "You see all the gears turning, the belts slapping, wood grain carts clattering along.

"It kind of hums, like a sewing machine, and the whole building has a nice, smooth rocking motion."

Visitors also can tour the Adams-Wilhite Store, which is filled with the stocked shelves that would be found in a general store of the 1900s.

"We have eight picnic sites with grills," Bobbitt said, "and a covered shelter with tables and grills that can be rented."

Visitors may have to share the view of the mill with local artists who have been known to set up their easels to capture the serene and picturesque setting.

For more information, visit mostateparks.com.

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

(Opposite page) Dillard Mill State Historic Site is on Huzzah Creek, south of Steelville. (Above) Bollinger Mill State Historic Site includes the four-story stone-and-brick mill building and Burfordville Covered Bridge. (Left) An antique spool cabinet sits on the counter of the Adams-Wilhite General Store at Dillard Mill.

Youth Education Website Launched

The Department of Natural Resources has a responsibility to inform Missourians about the importance of our natural and cultural resources. The Youth Education and Interpretation Program seeks to provide today's youth with the knowledge and appreciation of nature, encouraging them to connect with and care for our natural and cultural resources now, and into the future. The department's Youth Education and Interpretation Program has launched a new website specially designed to help fulfill this critical mission area.

We continue to develop content for the site and provide our stakeholders, youth, teachers and communities with valuable information. Please visit and share our new website, which can be found at dnr.mo.gov/education.

State Parks Youth Corps Accepting Applications

For the seventh year, the State Parks Youth Corps (SPYC) will provide Missouri youth the opportunity to work outdoors improving our parks and historic sites. Online applications are now being accepted for Missouri youth ages 17 to 24 to participate in the 2016 program.

SPYC, a nationally recognized jobs initiative started by Gov. Jay Nixon in 2010 to enhance Missouri's 88 state parks and historic sites, is a cooperative partnership between the Division of Workforce Development and Missouri State Parks.

In 2016, SPYC will offer more than 600 positions at state parks and historic sites, as well as in municipal parks in St. Louis and Kansas City. Visit thinkoutside.mo.gov to fill out an online application.

Help the Monarch Butterfly

The monarch is one of the most familiar butterflies in North America. The orange-and-black butterfly is known for its annual, multigenerational migration from Mexico to as far north as Canada. Monarch populations have decreased considerably over the past 20 years, mainly due to considerable habitat loss in the United States and Mexico.

Fortunately, the state of Missouri is within the insect's migratory flyway so we have a great opportunity to help meet the needs of this iconic butterfly.

Planting milkweed and other nectar-bearing plants is one way to help

Time Exposures

Missouri State Parks archives

In 1903, Robert M. Snyder visited the area of Ha Ha Tonka Spring and Lake for the first time. He was so impressed with what he saw that he purchased more than 5,000 acres of the area in 1904. He planned to build a private retreat with a three-story European-style castle as the centerpiece. Snyder, a wealthy Kansas City businessman, said of his purchase, "Here I will spend my leisure, secure from the worries of business and the excitement of city life. I will fish and loaf and explore the caves of these hills, with no fear of intrusion." Construction began on the property in 1905, only to be halted a year later by the sudden death of Snyder in one of the state's first automobile accidents.

Snyder's sons eventually finished the project, and the castle and property were later leased for use as a hotel. In 1942, a chimney fire gutted the inside of the castle and destroyed the adjoining carriage house. In 1976, the remaining water tower was burned by vandals. Today, only the castle ruins remain.

Back in 1909, Gov. Herbert S. Hadley had proposed the area as Missouri's first state park, but it wasn't added to the park system until 1978. Still, this 1929 photograph illustrates the early popularity of the site as a tourist destination. Written by an unknown photographer, the caption reads, "Black and white print of view of Mr. and Mrs. William Sundwall, Geraldine Koons and J.R. Edison of Jordan, Mo. The castle is in the background." Ha Ha Tonka State Park holds Missouri's premiere showcase of karst geology, with features such as a natural bridge, tall and majestic bluffs and numerous sinkholes. Each day, Ha Ha Tonka Spring discharges approximately 58 million gallons of water through the park. Learn more at mostateparks.com/park/ha-ha-tonka-state-park.

Send your photo to "Time Exposures," c/o* Missouri Resources*, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1980 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that may be of interest to our readers.

the monarchs meet their needs. This helps support monarch populations and is a great way to help other pollinators, as well.

For information on the monarch butterfly and how you can help, go to dnr.mo.gov/education/monarchs.htm.

Permit Modifications List Available Online

Facilities or businesses actively treating, storing (for longer than allowed by the hazardous waste generator regulations) or disposing of hazardous waste in Missouri must get a hazardous waste permit. These permits contain hazardous waste management operating and closure requirements for facilities that are actively managing hazardous waste.

If applicable, the permits also will contain post-closure, corrective action and financial assurance requirements for facilities with previously closed hazardous waste management units that require continuing care for facilities with demonstrated releases to the environment.

The department is notifying the public of all hazardous waste permit modifications processed in Missouri for calendar year 2015. Visit the permit modification list for calendar year 2015 (and previous years) at dnr.mo.gov/env/hwp/permits/publications.htm.

New Geologic Maps Published

The Missouri Geological Survey, a division of the Department of Natural Resources, recently published the 1:250,000-scale geologic map, "Elevation of the Proterozoic (Precambrian) Surface in Southeastern Missouri." The map covers all or part of Bollinger, Butler, Carter, Crawford, Dent, Franklin, Gasconade, Iron, Jefferson, Madison, Phelps, Reynolds, Shannon, Ste. Genevieve, St. Francois, Washington and Wayne counties, and is centered on the St. Francois Mountains.

The department also has published a geologic map compiled by geology student Kyle J. Scherlinck, funded by the National Park Service through the Geological Society of America's GeoCorps Program and an agreement with Missouri State University. The 1:24,000-scale map, "Geologic Map of George Washington Carver National Monument and Surrounding Area," covers part of Newton County.

Geologic maps provide a baseline for data related to energy, mineral and water resources, natural hazards, soil conservation and climate science. Virtually all mineral, energy, water, industrial construction, public works and urban development projects can benefit from a geologic map. Maps may be purchased from the Missouri Geology Store at missourigeologystore.com and at 111 Fairgrounds Road, Rolla. View thumbnail versions at dnr.mo.gov/geology/statemap/missouri-maps.htm.

Our Missouri Waters

Lower Missouri Crooked River Watershed

Can residents of a watershed that encompasses 11 counties and a major metropolitan area get together to establish priorities and plan for its future? Why not? Three regional planning commissions worked hard sending postcards and emails, calling residents, and placing ads in newspapers and on local radio stations.

Don Schuster photo

This Lafayette County farm north of I-70 is in the southeast region of the Crooked River Watershed.

Residents of the Lower Missouri Crooked River Watershed first gathered in December 2015 to meet within their respective areas. The urban participants met in Kansas City. The rural participants met in Lexington and in Carrollton. The Department of Natural Resources worked in partnership with Mid-America Regional Council, Pioneer Trails and Green Hills Regional Planning commissions, and Shockey Consulting to plan meetings and bring people together.

University of Missouri Extension water quality staff joined the volunteers to educate them on why watersheds are vital to our natural resources. Landowners personal experiences were shared. They discussed the priorities for this watershed: storm water management, flooding, water quality and other issues within the 1.7-million-acre watershed. The residents then formed smaller groups which met in June to write a Healthy Watershed Plan.

For news releases on the Web, visit dnr.mo.gov/news.

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at dnr.mo.gov/calendar/search.do.

Looking for a job in natural resources? Go to dnr.mo.gov/hr.

Top Spots for Boating

Eight Missouri state parks are located on large manmade lakes that are among the Midwest's most popular spots for boating.

One of the biggest, and busiest, is Lake of the Ozarks in the central part of the state in Camden and Miller counties. The 55,000-acre lake was created when Bagnell Dam impounded the Osage River for hydropower. Lake of the Ozarks State Park offers quiet coves that are undeveloped.

Two other large lakes, in the southwest corner of the state, are 43,000-acre Table Rock Lake and 25,000-acre Stockton Lake. Table Rock State Park in Taney County includes a marina that offers boat and personal watercraft rentals, parasailing, catamaran sailboat excursions, scuba diving and fishing guides. Stockton State Park in Cedar County includes a nationally recognized sailing school.

Harry S Truman and Pomme de Terre lakes are farther north. Truman Lake is 55,600 acres and the park, in Benton County, includes both a marina and sand beach. The lake at Pomme de Terre totals 7,800 acres. The state park is located on both the Hermitage and Pittsburg sides in Hickory County.

In the southeast corner of Missouri, 4,100-acre Lake Wappapello is nestled in the foothills of the Ozarks on the St. Francis River in Wayne County. Lake Wappapello State Park offers easy access to the lake with boat ramps and a sand beach.

Mark Twain Lake, at 18,000 acres, is the largest lake in northeast Missouri, with the 2,400-acre Long Branch Lake to the west. Mark Twain and Long Branch state parks (in Monroe and Macon counties, respectively) provide a variety of recreational opportunities on the water.

Big Lake, in the far northwest corner of the state on the Missouri River, is the state's largest oxbow lake at 646 acres. It is adjacent to Big Lake State Park in west-central Holt County, which has a large marsh and is a major feeding and resting area for birds and migratory waterfowl.

For directions, maps and individual park facts, go to mostateparks.com and click, "Find Your Park."

MoDNR file photo

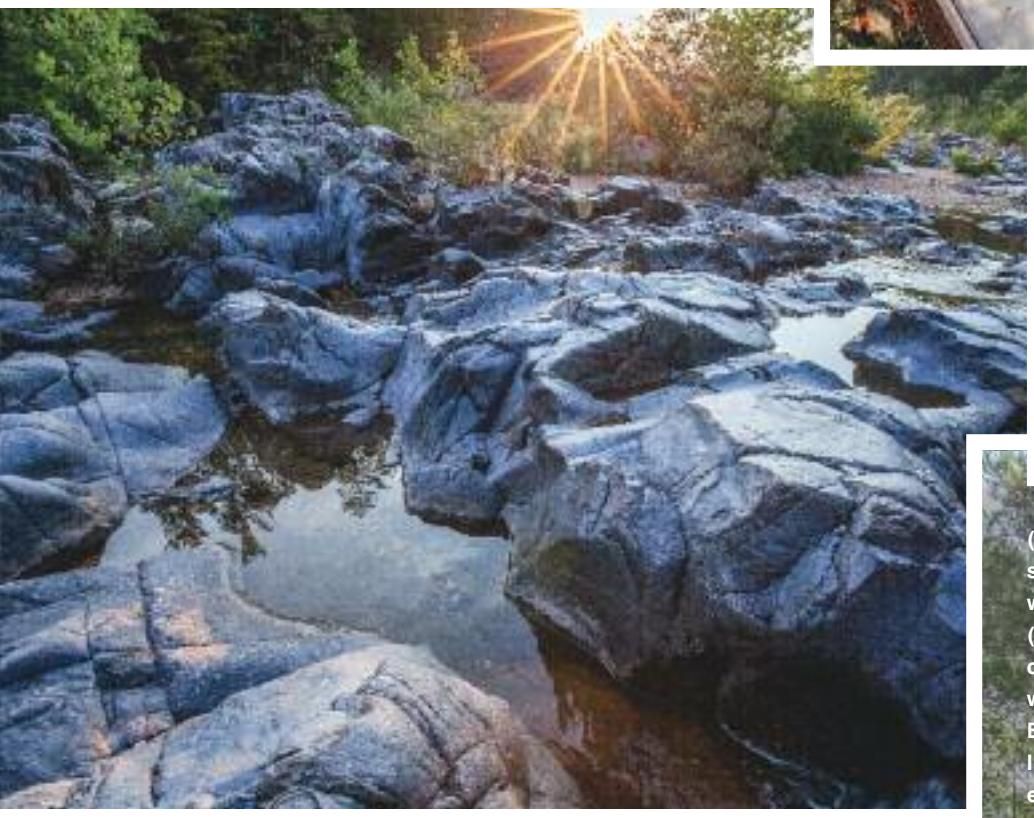
(Above) Tubing is a popular activity at parks with large lakes, like Long Branch State Park.
(Below left) Boat rentals are available at several state park marina locations.
(Below) A guest rides a personal watercraft at Stockton State Park as a sailboat glides by in the distance.

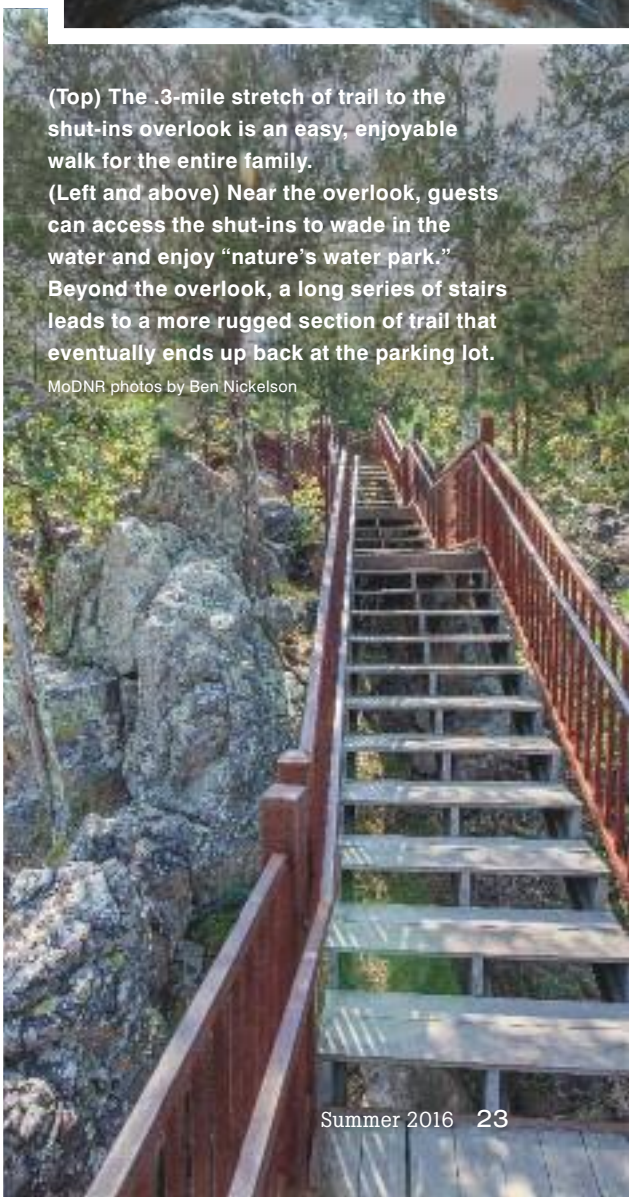
MoDNR photo by Ben Nickelson

MoDNR file photo

SHUT-INS TRAIL

AT JOHNSON'S SHUT-INS STATE PARK





(Top) The .3-mile stretch of trail to the shut-ins overlook is an easy, enjoyable walk for the entire family.
(Left and above) Near the overlook, guests can access the shut-ins to wade in the water and enjoy "nature's water park." Beyond the overlook, a long series of stairs leads to a more rugged section of trail that eventually ends up back at the parking lot.
MoDNR photos by Ben Nickelson

Shut-Ins Trail takes visitors to its namesake – the shut-ins, where the rushing waters of the East Fork of the Black River are "shut-in" by the hard volcanic rock. Over 1.4 billion years ago, violent volcanic eruptions created hard rhyolite bedrock forming the knobby shapes of the St. Francois Mountains. As the rhyolite cooled, it cracked in many places, creating pathways for flowing water. Over millions of years, water eroded the cracks into narrow channels. Scoured by waterborne sand and gravel, the channels grew deeper and wider. The eroding action of water continues to shape these rocks into the potholes – the plunge pools below small waterfalls – and chutes that form wild, natural waterslides that delight visitors today.

From the main parking lot, an easy, wheelchair-accessible .3-mile trail leads to an observation platform above the flowing waters of the shut-ins. The trail then becomes more difficult, continuing up a stairway.

Entering the East Fork Wild Area, Shut-Ins Trail follows natural tread through oak-hickory forest and small glade clearings, eventually returning to the main parking lot. This loop trail involves some short rocky climbs and a long series of stairs.

Johnson's Shut-Ins State Park is located 8 miles north of Lesterville in Reynolds County.

Rock Matters

coal

Coal, sometimes nicknamed "the rock that burns," is a product of nature's continual growth and decay. A sedimentary rock that will burn, coal is formed by compaction of altered and decomposed fossil plant material usually accumulated in ancient swamp-like areas.

MoDNR photo by Mark Gordon.

Through the centuries, prehistoric seas alternately advanced and receded, depositing layers of sediment on peat (decayed organic matter or vegetation). The sediment accumulated and the earth's crust shifted, compressing the peat, squeezing out its moisture and burying it deeper and deeper. Heat generated by the tremendous pressure on the buried beds drew out most of the oxygen and hydrogen, leaving a residue of impure carbon – coal.

Missouri was the first state west of the Mississippi River to produce coal commercially. Coal mining in Missouri is conducted entirely by surface mining methods but was mined historically by underground methods, as well.

Missouri coal is bituminous, but some cannel coal also is present. Bituminous coal occurs in horizontal beds or seams in the northern and western parts of the state and breaks with a blocky fracture. It is commonly layered and often contains impurities such as calcite, gypsum, pyrite, marcasite, clay minerals and quartz.

Cannel coal is found chiefly in old sinkhole deposits in central Missouri. It is composed almost entirely of plant spores, fractures conchoidally, and has a more massive structure than bituminous coal. Cannel coal burns to a very hot, rather quick fire because of the nature of its highly volatile content.

The principal value of coal is in the amount of heat it can generate, a factor directly related to its stage of development. Heat value is measured in British Thermal Units, or Btu. One Btu is the energy necessary to raise the temperature of one pound (one pint) of water one degree Fahrenheit. Heat values of Missouri coal on an as-received basis average 11,016 Btu per pound.

Coal continues to be a primary source of energy throughout the world. Missouri produced 9.1 trillion Btu of coal in 2013. Missouri's coal is burned at power plants to generate electricity and at limestone kilns to produce cement. According to the U.S. Energy Information Administration's coal consumption estimates, 806.5 trillion Btu of coal were consumed in Missouri in 2013. Natural gas used 281.5 trillion Btu.

The Department of Natural Resources ensures that mined land is returned to the best possible condition for use after mining is completed. Staff with the department's Land Reclamation Program work to ensure that Missouri's mineral resources are available for economic development, and after reclamation, the land is available for new development or public use.

The Abandoned Mine Lands Viewer identifies locations of reclaimed coal mining activities. The viewer is accessible at to dnr.mo.gov/geology/lrp/amlviewer.htm.

did you know?

Fluorescent Lamps Contain Mercury Vapor

Fluorescent lamps and bulbs have become a popular replacement for the less energy efficient incandescent light. While the amount of mercury in most fluorescent lamps is small, care should be taken in their handling to protect you and your family, as well as your waste hauler. Mercury vapors can be absorbed by our lungs when inhaled, accumulating in tissue and possibly causing nervous system damage.

Recycling fluorescent lightbulbs is recommended, especially if there is a household hazardous waste collection program, a universal waste handler or a certified recycler that accepts them. Some retail stores that sell fluorescent lamps also accept them for recycling. Disposal of these lamps in sanitary landfills also is legal for households and farmers. Separate disposal regulations apply to businesses.

Regardless of disposal method, safe handling to prevent breakage is paramount. Put old lamps into the box the replacements came in and seal them in a plastic bag before placing them near the top of your trash bin. If a bulb does happen to break, ventilate the area for 15 minutes before cleaning and make sure to wear disposable gloves when handling broken pieces. Use a piece of cardboard or paper to scoop up large pieces and pat the area with sticky tape to pick up fine particles. Wipe the area with a wet paper towel to catch whatever is left, and place all items into either a glass screw-top jar or a strong zipper-type plastic bag for disposal. If you use a plastic bag, double bag it. Vacuuming should be avoided as it can spread contamination, but if it's still necessary, wait a day to allow the mercury vapors to escape. Finally, don't forget to wash your hands and face when you are finished.

For more information, visit this EPA link at epa.gov/cfl.

Missouri Groundwater Observation Well Network

by Hylan Beydler photograph by Ben Nickelson

Groundwater is a precious natural resource. Because groundwater is so important to many Missourians, the Department of Natural Resources operates and maintains the state groundwater observation well network – a set of wells where water levels are measured every 30 minutes – including some that have provided information for 60 years.

"Missouri's aquifers are estimated to contain as much as 500 trillion gallons of potable groundwater," said Andrea Collier, a deputy director with the department's Missouri Geological Survey and Water Resources Center director. "In many areas, groundwater provides nearly all of the water used for private and public water supply and industrial needs. In other areas, it mostly supplies rural residents and farm needs."

The department operates and maintains the network which consists of 172 wells. The wells vary from less than 12 feet to more than 1,800 feet deep.

"Data from these wells are used to assess groundwater resources including existing and future needs for drinking water supplies, agriculture, industry, recreation, environmental protection and related needs," Collier said. "Data also are used to interpret impacts of climate change and use, determine trends, and evaluate water conflicts – each a component of the State Water Plan – a long-range plan developed by the department and stakeholders."

Observation wells located in 93 of Missouri's 114 counties monitor water levels in 13 separate aquifers. Some of the wells were constructed by the department specifically for measuring groundwater levels. Most began as water supply wells that were later discontinued and loaned or donated to the department.

The information is recorded every 30 minutes and transmitted to a satellite every hour. Groundwater level data are posted online in near real-time through a cooperative agreement with the U.S. Geological Survey. Before 1999, the information was collected manually every six to 12 weeks. In addition to groundwater level data collected, 41 sites also collect precipitation data and six are wetland sites where data is collected along with soil moisture.

"In addition to general water use, natural events such as earthquakes, changes in barometric pressure, tidal effects, precipitation, drought and river stages along with human-induced activities such as fluctuations from train vibrations and mine dewatering affect water levels," Collier said.

In December 2015, the department marked 16 years of providing groundwater data online in near real-time at dnr.mo.gov/geology/wrc/groundwater/gwnetwork.htm.

Hylan Beydler is division information officer for the department's Missouri Geological Survey.

Scotty Baumgartner, a hydrologist with the Department of Natural Resources' Water Resources Center, leads the effort for operating and maintaining the state groundwater monitoring network. This monitoring well is located on the grounds of the Missouri Department of Conservation's Rolla facility.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
PO Box 176
Jefferson City, MO 65102-0176

Passport to Adventure!

Missouri State Parks is celebrating 100 years! Officially established on April 9, 1917, the system has grown to include 88 state parks and historic sites throughout the state.

Experience all the park system has to offer by grabbing your Centennial Passport and heading out on an adventure. Visit mostateparks.com/passport for more information.

MISSOURI STATE PARKS

Missouri State Parks – a division of the Missouri Department of Natural Resources